

**OPERATING AND SERVICE MANUAL**

**NUMERIC DISPLAY**  
**(PART OF 5501A LASER TRANSDUCER SYSTEM)**

**10783A**

**SERIAL PREFIX: 1948A**

This manual applies directly to Hewlett-Packard Model 10783A serial prefix 1948A. For prefixes above 1948A, a change sheet is included with this manual. For prefixes below 1948A, refer to Section V.

**PRINTED: SEPT 1980**

Copyright      HEWLETT-PACKARD COMPANY      1975  
5301 STEVENS CREEK BLVD., SANTA CLARA, CALIF. 95050

**Manual Part No. 10783-90003**  
**Microfiche No. 10783-90004**

**Printed in U.S.A.**

## **CERTIFICATION**

*Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.*

## **WARRANTY**

This Hewlett-Packard system product is warranted against defects in materials and workmanship for a period of 90 days from date of installation. During the warranty period, HP will, at its option, either repair or replace products which prove to be defective.

Warranty service of this product will be performed at Buyer's facility at no charge within HP service travel areas. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses. In all other cases, products must be returned to a service facility designated by HP.

For products returned to HP for warranty service, Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

### **LIMITATION OF WARRANTY**

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

### **EXCLUSIVE REMEDIES**

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

## **ASSISTANCE**

*Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.*

*For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.*

**FEDERAL COMMUNICATIONS COMMISSION  
RADIO FREQUENCY INTERFERENCE  
STATEMENT**

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.



## TABLE OF CONTENTS

Section	Title	Page
I	GENERAL INFORMATION .....	1-1
	1-1. Scope of this Manual .....	1-1
	1-3. Instrument Identification and Manual Changes .....	1-1
	1-5. Description .....	1-1
	1-9. Hewlett-Packard Interface Bus .....	1-3
	1-12. Specifications .....	1-3
	1-14. Equipment Supplied and Accessories Available .....	1-3
II	INSTALLATION .....	2-1
	2-1. Introduction .....	2-1
	2-3. Unpacking and Inspection .....	2-1
	2-5. Preparation for Use .....	2-1
	2-7. Power Requirements .....	2-1
	2-9. Operating and Non-Operating Environment .....	2-1
	2-11. Installation .....	2-1
	2-13. Interconnecting Cables .....	2-2
	2-20. Operational Check and Warranty Claims .....	2-3
	2-22. Packaging for Reshipment .....	2-3
	2-24. Other Packaging Methods .....	2-3
	2-29. Storage .....	2-3
III	OPERATION AND PROGRAMMING .....	3-1
	3-1. Introduction .....	3-1
	3-3. Controls, Indicators, and Connectors .....	3-1
	3-5. Operating Procedures .....	3-3
	3-7. Preliminary Set-Up Procedures .....	3-3
	3-9. Programming Procedures .....	3-4
	3-12. Programming Codes .....	3-4
	3-14. Program Example 1 .....	3-5
	3-19. Program Example 2 .....	3-6
IV	MAINTENANCE .....	4-1
	4-1. Maintenance .....	4-1
	4-3. Maintenance and Troubleshooting .....	4-1
	4-5. Preventive Maintenance .....	4-1
	4-7. Visual Inspection .....	4-1
	4-9. Repair and Cleaning .....	4-1
V	REPLACEABLE PARTS AND BACKDATING .....	5-1
	5-1. Introduction .....	5-1
	5-3. Ordering Information .....	5-1
	5-6. Backdating .....	5-6
VI	SCHEMATIC DIAGRAMS .....	6-1
	6-1. Introduction .....	6-1
	6-3. Schematic Diagram Notes .....	6-1
	6-5. Reference Designator System .....	6-1
	6-7. Identification Markings on Printed-Circuit Boards .....	6-1
	6-12. Assembly Locations and Component Locators .....	6-3
	6-14. Schematic Diagrams .....	6-3

## LIST OF TABLES

Table	Title	Page
1-1	Specifications for 10783A Numeric Display .....	1-2
1-2	Equipment Supplied .....	1-3
1-3	Available Accessories .....	1-3
3-1	Address Switch Settings .....	3-3
3-2	Displayed Character Set Codes .....	3-4
3-3	Programming Codes .....	3-5
3-4	9830A Program Description, Example 1 .....	3-6
3-5	9830A Program Description, Example 2 .....	3-6
5-1	Replaceable Parts .....	5-3
5-2	Manufacturers Code List .....	5-6

## LIST OF FIGURES

Figure	Title	Page
1-1	10783A Numeric Display .....	1-1
2-1	10783A Rear Panel View .....	2-2
3-1	10783A Numeric Display Front Panel .....	3-1
3-2	10783A Numeric Display Rear Panel .....	3-2
6-1	Schematic Diagram Notes .....	6-2
6-2	A1 Main Schematic Diagram .....	6-5
6-3	A2 Display Assembly Schematic Diagram .....	6-7

## SECTION I

### GENERAL INFORMATION

#### 1N1. SCOPE OF MANUAL

1-2. This manual contains operating and service information for the Hewlett-Packard Model 10783A Numeric Display. Documentation concerning the Numeric Display may also be found in the HP 5501A Laser Transducer System Manual.

#### 1-3. INSTRUMENT IDENTIFICATION AND MANUAL CHANGES

1-4. Hewlett-Packard instruments have a 2-section, 10-character serial number (0000A00000), which is located on the rear panel. The 4-digit serial prefix identifies instrument changes. If the serial prefix of your instrument differs from that listed on the title page of this manual, there are differences between this manual and your instrument. Instruments having lower serial prefixes than that listed on the title page are documented in Section VII, and higher serial prefixes are covered with manual change sheets included with the manual. If the change sheet is missing, contact the nearest Hewlett-Packard Sales and Service Office listed on the inside rear cover of this manual.

#### 1-5. DESCRIPTION

1-6. The 10783A Numeric Display provides a readout of single or multiple axis displacement data from the 5501A Laser Transducer System. The display is used in conjunction with the Hewlett-Packard Interface Bus (HP-IB) and a bus controller such as a Hewlett-Packard Programmable Calculator or Computer. Fourteen seven-segment LED indicators with left-hand decimal points are used. This allows for displaying more than one axis of data. Six axis identifiers are supplied with each display module and may be inserted into a front panel holder. As an example, one 10783A can display 6 digits with sign and decimal point for x-axis and 5 digits, sign and decimal point for "Y" axis with a space between the two numbers. The X and Y identifier labels can be placed in the front panel below the appropriate digits.

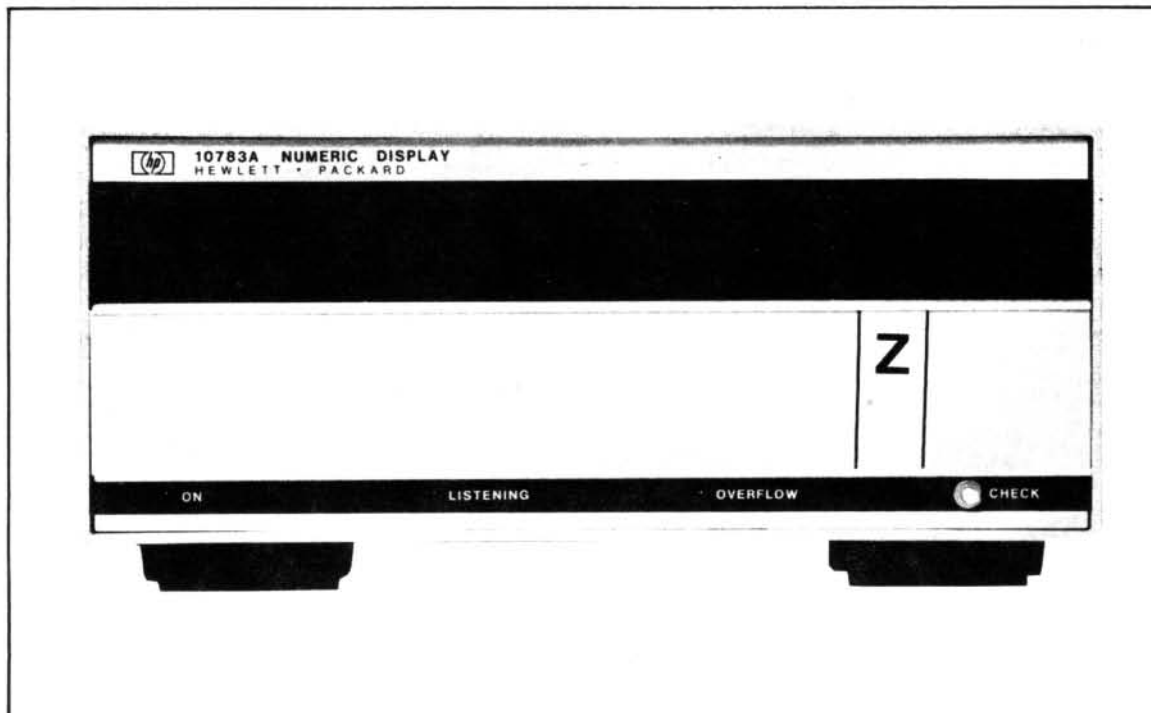


Figure 1-1. 10783A Numeric Display

Table 1-1. Specifications for 10783A Numeric Display

<p><b>Compatibility:</b> Hewlett-Packard Interface Bus (HP-IB)</p> <p><b>Input Power:</b> +5 Volts @ 1.2 Amperes</p> <p><b>Display:</b> 7 segment light emitting diode, 10.9 millimeters (0.43 inches) high; 14 characters, each with decimal point.</p> <p><b>Character Set:</b> 0 through 9, E, minus sign, space (blank), and decimal point.</p> <p><b>Front Panel:</b> On Indicator: Light means 10783A is powered.  Listening Indicator: Light means unit will accept characters for display.  Overflow Indicator: Light means 14-digit capacity of display has been exceeded.  Check: Switch lights up all 14 digits as the character "8" along with all decimal points to self-test the display. The check function also tests the Listening Indicator and Overflow Indicator lights.</p> <p><b>Rear Panel:</b> Address Switch: Sets HP-IB Listen Address of 10783A.  Interface Bus Connector: 24-pin connector mates with 10631A/B/C HP-IB Cable.  +5 Volt power on/off switch.  Terminal strip for +5 volt power input.</p> <p><b>Weight:</b> 1.14 kg (2 lbs., 8 oz.)</p> <p><b>Dimensions:</b> Height: 101.6 mm (4 inches) Width: 212.9 mm (8.38 inches) Depth: 289.6 mm (11.4 inches) Rack Height: 88.9 mm (3.5 inches)</p>
--

1-7. The character set displayed consists of digits 0 through 9, letter E, decimal point and minus sign. A space is generated by the ASCII code for space, comma, colon, and plus sign. The 10783A ignores all other characters except line feed which marks the end of the word. Either fixed point or floating point with scientific notation can be selected. Internal buffering of data eliminates any display flicker while the display is updating.

1-8. The HP 10783A connects to the Hewlett-Packard Interface Bus with a passive cable. The distance that the display can be separated from a system is subject to the overall requirements imposed for interconnection of devices with the HP Interface Bus, namely, aggregate cable length should not exceed 6 feet per box connected on the bus. See Section II for details of cable length.

### 1-9. HEWLETT-PACKARD INTERFACE BUS

1-10. Information to be displayed by the 10783A is received from the Hewlett-Packard Interface Bus (HP-IB). The HP-IB is fully compatible with Standard 488-1975 from the Institute of Electrical and Electronics Engineers, Incorporated, titled IEE Standard Digital Interface for Programmable Instrumentation.



**1-12. SPECIFICATIONS**

1-13. Table 1-1 lists the 10783A specifications.

**1-14. EQUIPMENT SUPPLIED AND ACCESSORIES AVAILABLE**

1-15. Table 1-2 lists equipment supplied and Table 1-3 lists available accessories.

*Table 1-2. Equipment Supplied*

<b>HP Part No.</b>	<b>Description</b>
10783A	Numeric Display
10783-90002	Instruction Manual
7120-4768	(6) Front Panel Labels (Axis Identifiers)
10783-60003	Power Cable

*Table 1-3. Available Accessories*

<b>HP Part No.</b>	<b>Description</b>
10631 A or B or C (1, 2 and 3 metres)	HP-IB Cable
Refer to 5501A Laser Transducer Ordering Information Sheet	Power Supplies (+5V dc at 1.2 amperes)



## SECTION II

# INSTALLATION

### 2-1. INTRODUCTION

2-2. This section provides instructions for unpacking, inspection, preparation for use, power requirements, operating environment, interconnecting cables, operational check and warranty claims, packaging for reshipment, storage, and field installation of options.

### 2-3. UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, inspect the 10783A for visible damage (scratches, cracks, etc.). If the 10783A is damaged, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately (offices are listed at the back of this manual). Keep the shipping carton and packing material for the carrier's inspection. The HP Sales and Service Office will arrange for repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

### 2-5. PREPARATION FOR USE

2-6. The following paragraphs provide information necessary to prepare the 10783A for use. Included are power requirements, operating environment, installation, interconnecting cables, an operational check and warranty claims.

### 2-7. Power Requirements

2-8. The 10783A requires +5 volts DC power at 1.2 amperes for operation. Power must be connected to the power terminals on the 10783A rear panel, see Figure 2-1.

## CAUTION

**Be sure to observe the polarity connections on the 5 Vdc terminal strip.**

### 2-9. Operating and Non-Operating Environment

2-10. The 10783A can be used in the following environments:

#### OPERATION

Temperature: 32°F to 130°F (0°C to 55°C)  
Relative Humidity: 0% to 95%

#### STORAGE

Temperature: -40°F to +167°F (-40°C to +75°C)  
Relative Humidity: 0% to 95%

### 2-11. Installation

2-12. The 10783A can be placed in any convenient position that meets the environmental requirements. Two factors should be considered: visibility of the 10783A display, and length of interconnecting cables and power wires. Refer to Figure 2-1 for a 10783A rear panel view showing the HP-IB connector and 10783A power terminals.

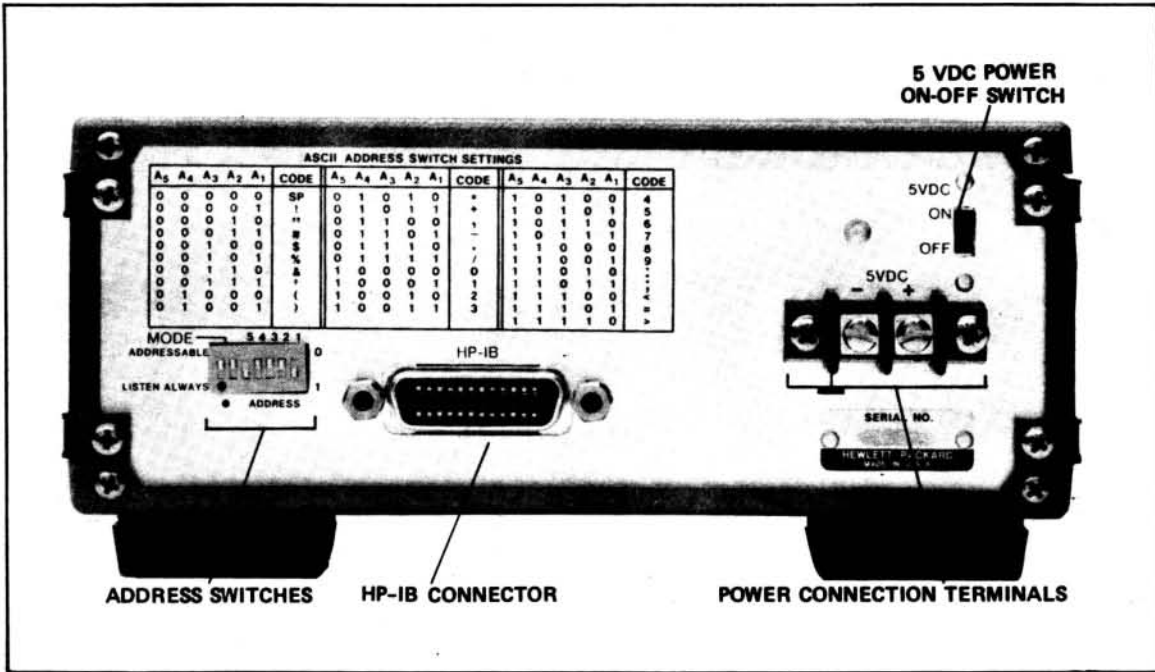


Figure 2-1. 10783A Rear Panel View

**2-13. Interconnecting Cables\***

2-14. The 10783A uses one of the Hewlett-Packard Interface Bus cables listed below to interconnect the 10783A to other units on the HP-IB:

HP-IB Cables (HP part numbers) 10631A or B or C (1, 2, or 3 meters)

2-15. The cable has a "piggyback" connector on each end so that cables can be added to a device which already has a cable connected to it. The connectors are provided with lock-screws to secure them to the instrument and to each other.

2-16. In order to ensure proper operation of the Bus, two rules regarding the total length of Bus Cables connected together must be observed. These are:

1. The total length of cable permitted to be used in conjunction with one Bus System must be less than or equal to 6-feet times the number of devices connected together.
2. The total maximum length of cable must not exceed 51-feet.

2-17. Restriction (1) implies that there may be up to 12-feet of cable between the first two devices (2 units x 6-ft/device = 12 ft). Additional units may be added using 6-foot cables up to a total of 8 units (8 units x 6-ft/device = 48 feet) using one 12-foot and six 6-foot cables (12 = 6 x 6 = 48). A ninth device could be added using a 3-foot cable (12 + 6 x 6 + 3 = 51) and still comply with Restriction (2). If more than nine devices are to be connected together, shorter than 6-foot cables must be used between some of the devices. For example, 15 devices can be connected together using one 12-foot and thirteen 3-foot cables (12 + 13 x 3 = 51). Other combinations may be used as long as both of the requirements of Restriction (1) and (2) are met. In making calculations, don't forget to count all the devices including Controllers.

2-18. There are no restrictions as to the ways various cables may be connected together. It is recommended that no more than three or four piggyback connectors be stacked together on one device as the resulting cantilevered structure can exert great force on the panels of the device where the connector is mounted and could cause physical damage.

2-19. The configuration may be linear (all cables connected end-to-end) or in a star (all cables branching out from a central point) or any combination of the above.

\*Refer to System Operating and Service Manual, 5501A Laser Transducer System.

## **2-20. Operational Check and Warranty Claims**

2-21. To determine if the 10783A is operating properly, the programming examples in Section III may be used. Contact the nearest HP Sales and Service Office (see manual back cover) for information relative to warranty claims.

## **2-22. PACKAGING FOR RESHIPMENT**

### **2-23. Original Packaging**

2-24. The same containers and materials used in factory packaging can be obtained through the Hewlett-Packard Sales/Service Offices listed at the rear of this manual.

2-25. If the 10783A is being returned to Hewlett-Packard for service, attach a tag indicating the type of service required, return address, model number and full serial number. Mark the container FRAGILE to assure careful handling.

2-26. In any correspondence refer to the instrument by model number and full serial number.

### **2-27. Other Packaging Methods**

2-28. If it becomes necessary to reship an instrument, good commercial packing should be used. Contract packaging companies in many cities can provide dependable custom packaging on short notice. The following general instructions should be followed when repackaging with commercially available materials.

- a. If shipping to a Hewlett-Packard Service Office or Center, attach a tag indicating the type of service required, return address, model number and full serial number.
- b. Wrap the instrument in heavy paper or plastic.
- c. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.
- d. Use enough shock-absorbing material (three to four inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.
- e. Seal the shipping container securely.
- f. Mark the shipping container FRAGILE to assure careful handling.

### **2-29. STORAGE**

2-30. If the instrument is to be stored for an extended period of time, it should be enclosed in a clean, sealed container.



## SECTION III

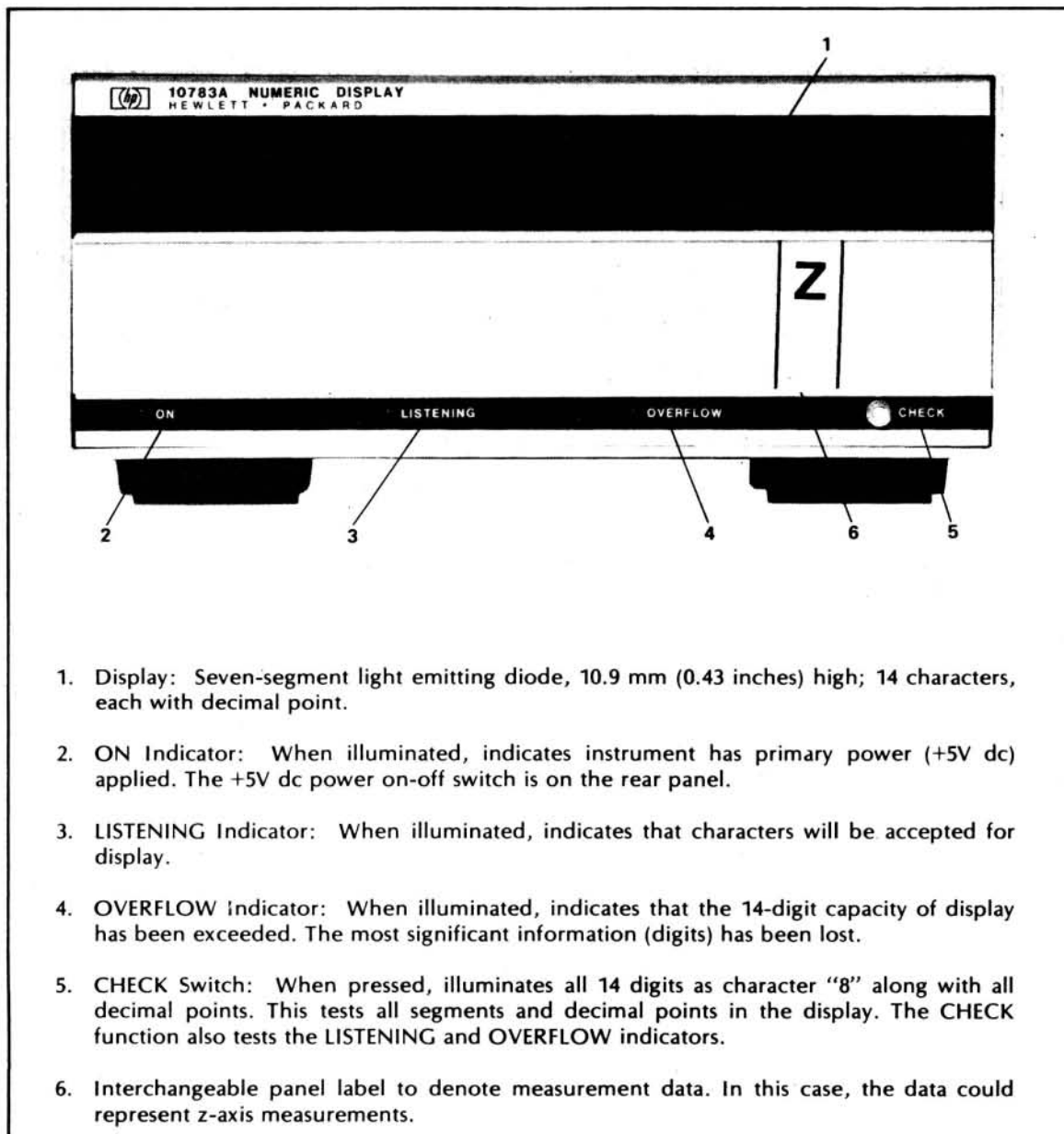
# OPERATION AND PROGRAMMING

### 3-1. INTRODUCTION

3-2. This section contains operating information including a description of controls and indicators, operating procedures, and programming examples.

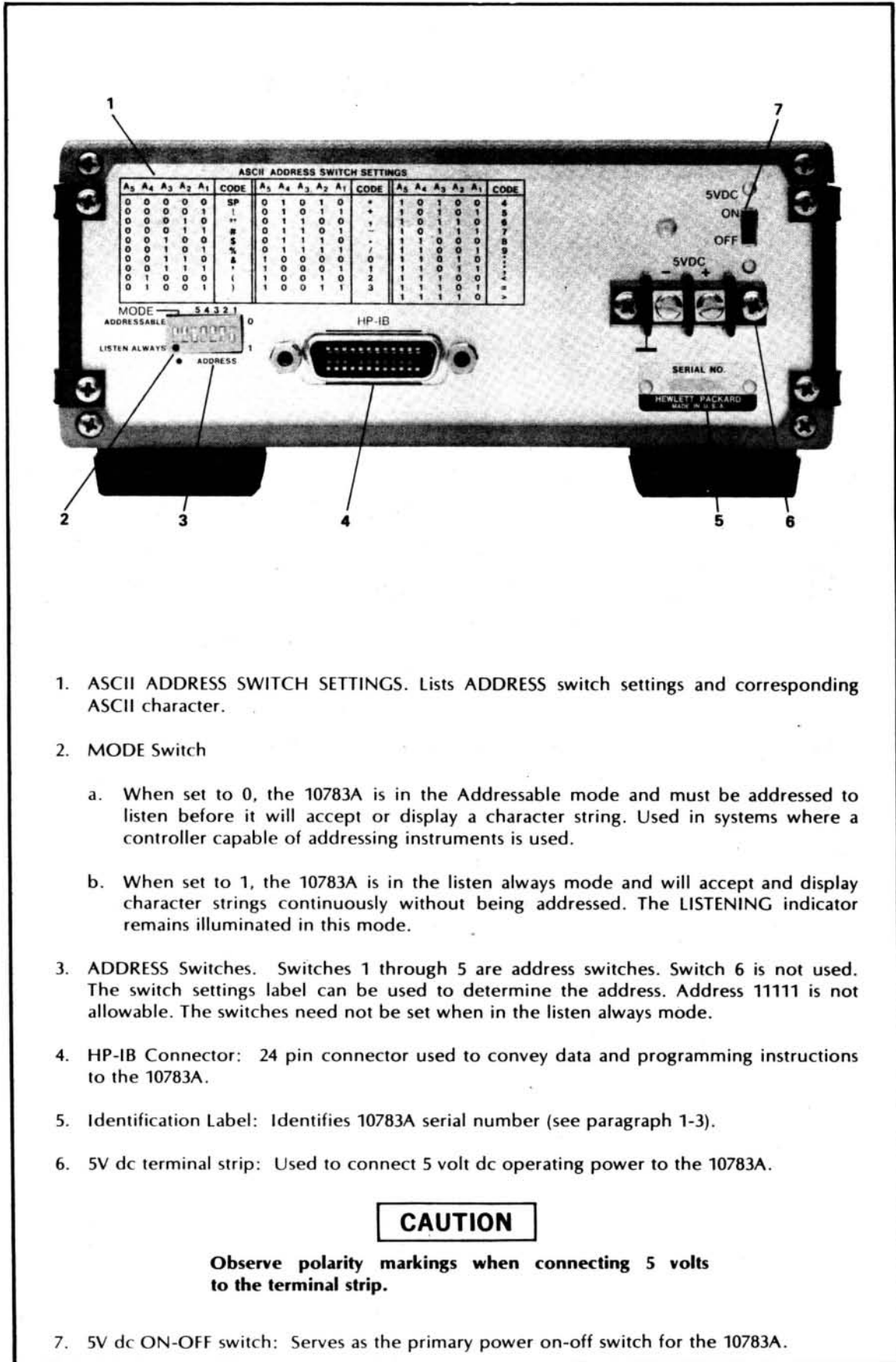
### 3-3. CONTROLS, INDICATORS, AND CONNECTORS

3-4. Figure 3-1 identifies and describes the front panel controls and indicators. Figure 3-2 shows the rear panel connectors and controls.



1. Display: Seven-segment light emitting diode, 10.9 mm (0.43 inches) high; 14 characters, each with decimal point.
2. ON Indicator: When illuminated, indicates instrument has primary power (+5V dc) applied. The +5V dc power on-off switch is on the rear panel.
3. LISTENING Indicator: When illuminated, indicates that characters will be accepted for display.
4. OVERFLOW Indicator: When illuminated, indicates that the 14-digit capacity of display has been exceeded. The most significant information (digits) has been lost.
5. CHECK Switch: When pressed, illuminates all 14 digits as character "8" along with all decimal points. This tests all segments and decimal points in the display. The CHECK function also tests the LISTENING and OVERFLOW indicators.
6. Interchangeable panel label to denote measurement data. In this case, the data could represent z-axis measurements.

Figure 3-1. 10783A Numeric Display Front Panel



1. ASCII ADDRESS SWITCH SETTINGS. Lists ADDRESS switch settings and corresponding ASCII character.
2. MODE Switch
  - a. When set to 0, the 10783A is in the Addressable mode and must be addressed to listen before it will accept or display a character string. Used in systems where a controller capable of addressing instruments is used.
  - b. When set to 1, the 10783A is in the listen always mode and will accept and display character strings continuously without being addressed. The LISTENING indicator remains illuminated in this mode.
3. ADDRESS Switches. Switches 1 through 5 are address switches. Switch 6 is not used. The switch settings label can be used to determine the address. Address 11111 is not allowable. The switches need not be set when in the listen always mode.
4. HP-IB Connector: 24 pin connector used to convey data and programming instructions to the 10783A.
5. Identification Label: Identifies 10783A serial number (see paragraph 1-3).
6. 5V dc terminal strip: Used to connect 5 volt dc operating power to the 10783A.

**CAUTION**

**Observe polarity markings when connecting 5 volts to the terminal strip.**

7. 5V dc ON-OFF switch: Serves as the primary power on-off switch for the 10783A.

Figure 3-2. 10783A Numeric Display Rear Panel



### 3-5. OPERATING PROCEDURES

3-6. Operating procedures consist of preliminary set-up procedures, programming codes and program examples.

### 3-7. PRELIMINARY SET-UP PROCEDURES

3-8. The following procedures are used to place the 10783A into operation.

- a. On the rear panel of the 10783A, connect 5 volts dc to the terminal strip. Be sure to observe the polarity markings. Set 5 Vdc ON-OFF switch to ON. The front panel ON indicator should light.
- b. Connect HP-IB cable from 10783A to system. See paragraph 2-13 for interconnecting cable considerations.
- c. Set the rear panel mode switch to ADDRESSABLE MODE (0 state) or LISTEN ALWAYS (1 state) as described below:
  - (1) ADDRESSABLE MODE (0 state). In this mode, the 10783A must be addressed to listen before it will accept or display a character string. This mode is used in systems where a controller capable of addressing instruments is used.
  - (2) LISTEN ALWAYS MODE (1 state). In this mode, the 10783A accepts and displays character strings continuously without being addressed. This mode is for use in a system without a controller where one or more 10783A's and a single talker are the only components in the system and all data on the bus is meant for display. The LISTENING indicator remains illuminated in this mode.
- d. Select a listen address from Table 3-1 and set the address switches 1 thru 5 on the rear panel of the 10783A. In general, any address switch setting is permissible except 11111 or an address already assigned to another instrument in the system. These switches need not be set if the MODE switch is in the LISTEN ALWAYS MODE. The 10783A is now ready for programming.

Table 3-1. Address Switch Settings

A <sub>5</sub>	A <sub>4</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	ASCII Equiv.	OCTAL Equiv.	A <sub>5</sub>	A <sub>4</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	ASCII Equiv.	OCTAL Equiv.
0	0	0	0	0	SP	040	1	0	0	0	0	0	060
0	0	0	0	1	!	041	1	0	0	0	1	1	061
0	0	0	1	0	"	042	1	0	0	1	0	2	062
0	0	0	1	1	#	043	1	0	0	1	1	3	063
0	0	1	0	0	\$	044	1	0	1	0	0	4	064
0	0	1	0	1	%	045	1	0	1	0	1	5	065
0	0	1	1	0	&	046	1	0	1	1	0	6	066
0	0	1	1	1	*	047	1	0	1	1	1	7	067
0	1	0	0	0	(	050	1	1	0	0	0	8	070
0	1	0	0	1	)	051	1	1	0	0	1	9	071
0	1	0	1	0	*	052	1	1	0	1	0	:	072
0	1	0	1	1	+	053	1	1	0	1	1	;	073
0	1	1	0	0	,	054	1	1	1	0	0	<	074
0	1	1	0	1	-	055	1	1	1	0	1	=	075
0	1	1	1	0	.	056	1	1	1	1	0	>	076
0	1	1	1	1	/	057							

### 3-9. PROGRAMMING PROCEDURES

3-10. Perform the following steps to program the 10783A.

- a. Program the bus controller to send the listen address for the 10783A. Refer to Table 3-1 for address switch settings. Addressing the 10783A is not necessary if the mode switch is set to the LISTEN ALWAYS MODE (see paragraph 3-8).
- b. Send the character string to be displayed. The character set that the 10783A displays is listed in Table 3-2. The display is limited to a maximum of 14 characters and 14 decimal points. If more than 14 characters are sent, the OVERFLOW indicator will illuminate and the last 14 characters received will be displayed.
- c. Send the ASCII line feed character to start the display of the character string. The display is right justified. The first character received will be the most significant digit displayed and the last digit received will be the least significant digit displayed.
- d. Repeat steps b and c for each character string to be displayed.

3-11. UNADDRESSING (can be used only when the 10783A is in the ADDRESSABLE MODE). Unaddressing the 10783A stops the instrument from accepting characters for display. The 10783A may be re-addressed at any time to receive the next set of characters for display. Unaddressing is used to keep unwanted character strings from being displayed. There are two methods used to unaddress the 10783A, (1) sending the unlisten command on the DIO lines, or (2) setting the IFC line low.

- a. Unlisten Command. This command is sent on the DIO lines (with ATN low) and causes the 10783A to unaddress itself (stop listening). This command unaddresses all listeners on the bus but has no effect on bus talkers. This command is generally used to unaddress listeners that are not to monitor forth-coming information.
- b. IFC. The IFC (Interface Clear) signal is implemented by setting the IFC line low. This action unconditionally unaddresses the 10783A, and halts all activity on the bus. This command is generally used by a controller to halt bus activity prior to taking control.

Table 3-2. Displayed Character Set Codes

DIO Lines							Octal Equiv.	ASCII Equivalent	Displayed Character
7	6	5	4	3	2	1			
0	1	1	0	0	0	0	060	0	0
0	1	1	0	0	0	1	061	1	1
0	1	1	0	0	1	0	062	2	2
0	1	1	0	0	1	1	063	3	3
0	1	1	0	1	0	0	064	4	4
0	1	1	0	1	0	1	065	5	5
0	1	1	0	1	1	0	066	6	6
0	1	1	0	1	1	1	067	7	7
0	1	1	1	0	0	0	070	8	8
0	1	1	1	0	0	1	071	9	9
1	0	0	0	1	0	1	105	E	E
0	1	0	1	1	1	0	056	.	(decimal point)
0	1	0	1	0	1	1	053	+	(plus sign)
0	1	0	1	1	0	0	054	,	(comma)
0	1	1	1	0	1	0	072	:	(colon)
0	1	0	1	1	0	1	055	-	(minus sign)
0	1	0	0	0	0	0	040	SP	(Space)

Note: Any other inputs are not recognized and are not displayed.

### 3-12. PROGRAMMING CODES

3-13. A description of the codes used in programming the 10783A is summarized in Table 3-3.

Table 3-3. Programming Codes

Signal/Code	Bus Lines Used	Remarks	10783A Response
Listen Address Codes	DIO Lines	Any ASCII code of the form 01A <sub>5</sub> A <sub>4</sub> A <sub>3</sub> A <sub>2</sub> A <sub>1</sub> where A <sub>5</sub> -A <sub>1</sub> can be any combination of 1's and 0's except 11111. Refer to Table 3-1 for Listen Address listings and to Figure 3-3 for address switch settings.	Illuminates LISTENING indicator. Prepares 10783A to accept characters for display.
Unlisten Command	DIO Lines	ASCII question mark "?" character unaddresses 10783A.	Extinguishes LISTENING indicator and halts character acceptance or change in display. Does not blank display.
Interface Clear (IFC)	IFC Line	Single line signal. When IFC is low it unaddresses 10783A.	Produces same action as unlisten command.
Displayed Character Set	DIO Lines	Digits "0 thru 9," letter "E," minus sign "-", plus sign "+", comma ",", colon ":", decimal point ".", and space "SP". No other characters accepted or displayed. See Table 3-2.	"SP" "," ":" and "+" produce a space (blank) on display. All other characters of set are displayed as sent.
ASCII Line-feed (LF)	DIO Lines	Puts 10783A in Update mode.	Displays character string sent prior to linefeed.

**3-14. PROGRAM EXAMPLE 1**

3-15. The following paragraphs describe an example of programming an HP 9830A Calculator (used as a bus controller) to instruct the 10783A to display a string of characters. The 10783A response to the program will be to display -123.456789 E03.

**NOTE**

It is assumed that a system including the 9830A Calculator, the ASCII Interface Card, the 9866A Printer, the Extended I/O ROM and the 10783A (with its address switches set to 10100) has been interconnected and prepared for operation. For detailed operating procedures, refer to 9830A Operating and Programming Manual HP Part No. 09830-90001 and to the extended I/O ROM Operating Manual, HP Part No. 09830-90007. Also refer to Hewlett-Packard Interface Bus Users Guide, 9830A.

3-16. **LOADING THE PROGRAM.** Prior to loading the program, push the STOP key down until STOP appears on the display. If display remains blank, refer to 9830A Operating and Programming Manual, Appendix A. Push the remaining keys to program the calculator as shown in the following printer list:

9830A Calculator Program List, Example 1

```
10 CMD "?U4"
20 OUTPUT (13,*)"-123.456789 E03"
30 END
```

3-17. **VERIFYING THE PROGRAM.** After the program has been loaded, push the LIST and EXECUTE keys. This will run a printer list of the program. Check the list to verify that the program was entered correctly. A detailed program description is shown in Table 3-4.

3-18. **RUNNING THE PROGRAM.** To run the program, push the RUN and EXECUTE keys.

Table 3-4. 9830A Program Description, Example 1

Program Line No.	Description
10	Unaddresses all listeners on the bus (?). Addresses the 9830A to talk (U) and 10783A to listen (4). (Use unshifted U key.p
20	Output through HP-IB Interface Card (select Code 13), using using standard "Free-Field" format (*), the data -123.456789 E03 (use space bar between 9 and E to get a blank). Use unshifted E key.
30	Ends program.
10783A DISPLAY -123.456789 E03	

### 3-19. PROGRAM EXAMPLE 2

3-20. This example programs the 9830A to instruct the 10783A to display two separate measurements; 10.2345 in the left most digits and 9.876E-2 in the right side of the display. The first portion of the display could represent one axis of a laser measurement while the right portion could represent a different axis.

3-21. Refer to paragraph 3-16, 3-17, and 3-18 for loading, verifying, and running the program.

9830A Calculator Program List, Example 2

```
10 CMD "?U4"
20 OUTPUT (13,*)"10.2345 9.876E-2"
30 END
```

Table 3-5. 9830A Program Description, Example 2

Program Line No.	Description
10	Unaddresses all listeners on the bus (?). Addresses the 9830A to talk (U) and 10783A to listen (4). (Use unshifted U key.)
20	Output through HP-IB Interface Card (select Code 13) using standard "Free-Field" format (*), the data 10.2345 (blank) 9.876E-2.
30	Ends program.
10783A DISPLAY 10.2345 9.876E-2	

## 10783A

### PROGRAMMING SUMMARY SHEET

**Possible Listen Addresses:** Any ASCII code of the form  $01A_5A_4A_3A_2A_1$  where  $A_5 - A_1$  can be any combination of 1's & 0's other than 11111.  $A_5 - A_1$  are set by address switches on the back panel of the 10783A. 1 = DOT IN, 0 = DOT OUT on address switches.

**Specifications:** Bus load is 1.1; cycle time is 2.5  $\mu$ s per character; power requirements, 5 Vdc @ 1.2 amperes.

#### PROGRAMMING CODES

Signal/Code	Bus Lines Used	Remarks	10783A Response
Listen Address Codes	DIO Lines	Any ASCII code of the form $01A_5A_4A_3A_2A_1$ where $A_5 - A_1$ can be any combination of 1's and 0's except 11111.	Illuminates LISTENING indicator. Prepares 10783A to accept characters for display.
Unlisten Command	DIO Lines	ASCII question mark "?" character unaddresses 10783A.	Extinguishes LISTENING indicator and halts character acceptance or change in display. Does not blank display.
Interface Clear (IFC)	IFC Line	Single line signal. When IFC is low it unaddresses 10783A.	Produces same action as unlisten command.
Displayed Character Set	DIO Lines	Digits "0 thru 9", letter "E," minus sign "-", plus sign "+", comma ",", colon ":", decimal point ".", and space "SP". No other characters accepted or displayed. See Table 3-2.	"SP" " " ":" and "+" produce a space (blank) on display. All other characters of set are displayed as sent.
ASCII Linefeed (LF)	DIO Lines	Puts 10783A in Update Mode.	Displays character string sent prior to linefeed.

#### DIGITAL BUS PIN SUMMARY

Digital Bus Connector Pin Number	Line Name	Use
1-4, 13-15	DIO1-7	Carries characters to 10783A for display or for processing as Bus commands.
16	DIO8	Not monitored or driven, terminated by resistive network.
6	DAV	These three lines make up the "handshake" system on the HP Interface Bus. DAV is monitored and RFD and DAC are driven by 10783A to control rate of data transferred on DIO lines.
7	RFD	
8	DAC	
9	IFC	Unconditionally clears Listen F/F, halting remote operation.
11	ATN	Indicates to 10783A whether character on DIO lines is Bus command or for display.
17	REN	Not monitored or driven, terminated by resistive network.
5	EOI	Not monitored or driven, terminated by resistive network.
10	SRQ	Not monitored or driven, terminated by resistive network.
12	Shield	Not connected.
18-24	Grounds	Connected to chassis ground.



## **SECTION IV**

# **MAINTENANCE**

### **4-1. MAINTENANCE**

4-2. This section contains maintenance and service information references for the 10783A.

### **4-3. MAINTENANCE AND TROUBLESHOOTING**

4-4. The 10783A does not operate separately from a model 5501A Laser Transducer system or other data source. Procedures to isolate system troubles to this assembly are contained in the 5501A System Manual. Schematics, component locators, and parts list are contained in this manual to aid in troubleshooting.

### **4-5. PREVENTIVE MAINTENANCE**

4-6. The preventive maintenance procedures given in the following paragraphs are provided to help prolong the useful life of the model.

#### **4-7. Visual Inspection**

4-8. Inspect the unit for indications of mechanical and electrical defects. Look for signs of overheating, corrosion, accumulations of dust, oil, loose electrical connections, or broken parts.

#### **4-9. Repair and Cleaning**

4-10. Repair any obvious defects; and if necessary clean the unit with a brush, compressed clean dry air jet, or a vacuum cleaner, or a suitable liquid solvent.





## SECTION V REPLACEABLE PARTS AND BACKDATING

### 5-1. INTRODUCTION

5-2. This section contains information for ordering replacement parts and backdating information Table 5-1 lists parts in alphanumeric order of their reference designators and indicates the description and HP Part Number of each part, together with any applicable notes. The table includes the following information.

- a. Description of part (see abbreviation below).
- b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 5-2.
- c. Manufacturer's part number.
- d. Total quantity used in the instrument.

### 5-3. ORDERING INFORMATION

5-4. To obtain replacement parts, address order of inquiry to your local Hewlett-Packard Sales and Service Office (see lists at rear of this manual for addresses). Identify parts by their Hewlett-Packard part numbers, and reference designation (including instrument model number).

5-5. To obtain a part that is not listed, include:

- a. Instrument model number.
- b. Instrument serial number.
- c. Description of the part.
- d. Function and location of the part.

### REFERENCE DESIGNATIONS

A	= assembly	E	= miscellaneous electrical part	P	= electrical connector (movable portion); plug	U	= integrated circuit; microcircuit
AT	= attenuator; isolator; termination	F	= fuse	Q	= transistor; SCR; triode thyristor	V	= electron tube
B	= fan; motor	FI	= filter	R	= resistor	VR	= voltage regulator; breakdown diode
BT	= battery	H	= hardware	RT	= thermistor	W	= cable; transmission path; wire
C	= capacitor	HY	= circulator	S	= switch	X	= socket
CP	= coupler	J	= electrical connector (stationary portion); jack	T	= transformer	Y	= crystal unit—piezoelectric
CR	= diode; diode thyristor; varactor	K	= relay	TB	= terminal board	Z	= tuned cavity; tuned circuit
DC	= directional coupler	L	= coil; inductor	TC	= thermocouple		
DL	= delay line	M	= meter	TP	= test point		
DS	= annunciator; signaling device (audible or visual); lamp; LED	MP	= miscellaneous mechanical part				

### ABBREVIATIONS

A	= ampere	avg	= average	CHAN	= channel	dc	= direct current
ac	= alternating current	AWG	= American wire gauge	cm	= centimeter	deg	= degree (temperature interval or difference)
ACCESS	= accessory	BAL	= balance	CMO	= cabinet mount only		
ADJ	= adjustment	BCD	= binary coded decimal	COAX	= coaxial		
A/D	= analog-to-digital	BD	= board	COEF	= coefficient		
AF	= audio frequency	BE (CU)	= beryllium copper	COM	= common		
AFC	= automatic frequency control	BFO	= beat frequency oscillator	COMP	= composition		
AGC	= automatic gain control	BH	= binder head	COMPL	= complete		
AL	= aluminum	BKDN	= breakdown	CONN	= connector	F	= degree Fahrenheit
ALC	= automatic level control	BP	= bandpass	CP	= cadmium plate	K	= degree Kelvin
AM	= amplitude modulation	BPF	= bandpass filter	CRT	= cathode-ray tube	DEPC	= deposited carbon
AMPL	= amplifier	RRS	= brass	CTI	= complementary transistor logic	DET	= detector
APC	= automatic phase control	BWO	= backward-wave oscillator	CW	= continuous wave	diam	= diameter
ASSY	= assembly	CAL	= calibrate	cw	= clockwise	DIA	= diameter (used in parts list)
AUX	= auxiliary	ccw	= counterclockwise	cm	= centimeter	DIFF	= differential amplifier
		CER	= ceramic	D A	= digital-to-analog	AMPL	= differential amplifier
				dB	= decibel	div	= division
				dBm	= decibel referred to 1 mW	DPDT	= double-pole, double-throw
						DR	= drive

### ABBREVIATIONS

DSB	= double sideband	MFR	= manufacturer	PIV	= peak inverse voltage	TFT	= thin-film transistor
DTL	= diode transistor logic	mg	= milligram	pk	= peak	TGL	= toggle
DVM	= digital voltmeter	MHz	= megahertz	PL	= phase lock	THD	= thread
ECL	= emitter coupled logic	mH	= millihenry	PLO	= phase lock oscillator	THRU	= through
EMF	= electromotive force	mho	= mho	PM	= phase modulation	TI	= titanium
EDP	= electronic data processing	MIN	= minimum	PNP	= positive-negative-positive	TOI	= tolerance
ELECT	= electrolytic	min	= minute (time)	P O	= part of	TRIM	= trimmer
ENCAP	= encapsulated	MINAT	= miniature	POLY	= polystyrene	TSTR	= transistor
EXT	= external	mm	= millimeter	PORC	= porcelain	TTI	= transistor-transistor logic
F	= farad	MOD	= modulator	POS	= positive; position(s) (used in parts list)	TV	= television
FET	= field-effect transistor	MOM	= momentary	POSN	= position	TVI	= television interference
F F	= flip-flop	MOS	= metal-oxide semiconductor	POT	= potentiometer	TWT	= traveling wave tube
FH	= flat head	ms	= millisecond	p-p	= peak-to-peak	U	= micro (10 <sup>-6</sup> ) (used in parts list)
FIL. H	= fillister head	MTG	= mounting	PP	= peak-to-peak (used in parts list)	UF	= microfarad (used in parts list)
FM	= frequency modulation	MTR	= meter (indicating device)	PPM	= pulse-position modulation	UHF	= ultrahigh frequency
FP	= front panel	mV	= millivolt	PREAMPL.	= preamplifier	UNREG	= unregulated
FREQ	= frequency	mVac	= millivolt, ac	PRF	= pulse-repetition frequency	V	= volt
FXD	= fixed	mVdc	= millivolt, dc	PRR	= pulse repetition rate	VA	= voltampere
g	= gram	mVpk	= millivolt, peak	ps	= picosecond	Vac	= volts, ac
GE	= germanium	mV p-p	= millivolt, peak-to-peak	PT	= point	VAR	= variable
GHz	= gigahertz	mVrms	= millivolt, rms	PTM	= pulse-time modulation	VCO	= voltage-controlled oscillator
G	= glass	mW	= milliwatt	PWM	= pulse-width modulation	Vdc	= volts, dc
GND	= grounded	MUX	= multiplex	PWV	= peak working voltage	VDCW	= volts, dc, working (used in parts list)
H	= henry	MY	= mylar	RC	= resistance-capacitance	V(F)	= volts, filtered
h	= hour	μA	= microampere	RECT	= rectifier	VFO	= variable-frequency oscillator
HET	= heterodyne	μF	= microfarad	REF	= reference	VHF	= very-high frequency
HEX	= hexagonal	μH	= microhenry	REG	= regulated	Vpk	= volts, peak
HD	= head	μmho	= micromho	REPL.	= replaceable	Vp-p	= volts, peak-to-peak
HDW	= hardware	μs	= microsecond	RF	= radio frequency	Vrms	= volts, rms
HF	= high frequency	μV	= microvolt	RFI	= radio frequency interference	VSWR	= voltage standing wave ratio
HG	= mercury	μV ac	= microvolt, ac	RH	= round head; right hand	VTO	= voltage-tuned oscillator
HI	= high	μVdc	= microvolt, dc	RLC	= resistance-inductance-capacitance	VTVM	= vacuum-tube voltmeter
HPF	= Hewlett-Packard	μVpk	= microvolt, peak	RMO	= rack mount only	V(X)	= volts, switched
HPF	= high pass filter	μV p-p	= microvolt, peak-to-peak	rms	= root-mean-square	W	= watt
HR	= hour (used in parts list)	μVrms	= microvolt, rms	RND	= round	W/	= with
HV	= high voltage	μW	= microwatt	ROM	= read-only memory	WIV	= working inverse voltage
Hz	= Hertz	nA	= nanoampere	R&P	= rack and panel	WW	= wirewound
IC	= integrated circuit	NC	= no connection	RWV	= reverse working voltage	W/O	= without
ID	= inside diameter	N. C.	= normally closed	S	= scattering parameter	YIG	= yttrium-iron-garnet impedance
IF	= intermediate frequency	NE	= neon	s	= second (time)	Zo	= characteristic impedance
IMPG	= impregnated	NEG	= negative	S ..	= second (plane angle)		
in	= inch	nF	= nanofarad	S-B	= slow-blow (fuse) (used in parts list)		
INCD	= incandescent	NI PL	= nickel plate	SCR	= silicon controlled rectifier; screw		
INCL.	= include(s)	N O	= normally open	SE	= selenium		
INP	= input	NORM	= nominal	SECT	= sections		
INS	= insulation	NPN	= negative-positive-negative	SEMICON	= semiconductor		
INT	= internal	NPO	= negative-positive zero (zero temperature coefficient)	SHF	= superhigh frequency		
kg	= kilogram	NRFR	= not recommended for field replacement	SI	= silicon		
kHz	= kilohertz	NSR	= not separately replaceable	SIL	= silver		
kΩ	= kilohm	ns	= nanosecond	SL	= slide		
kV	= kilovolt	nW	= nanowatt	SNR	= signal-to-noise ratio		
lb	= pound	OBI	= order by description	SPDT	= single-pole, double-throw		
LC	= inductance-capacitance	OD	= outside diameter	SPG	= spring		
LED	= light-emitting diode	OH	= oval head	SR	= split ring		
LF	= low frequency	OP AMPL.	= operational amplifier	SPST	= single-pole, single-throw		
LG	= long	OPT	= option	SSB	= single sideband		
LH	= left hand	OSC	= oscillator	SST	= stainless steel		
LIM	= limit	OX	= oxide	STL.	= steel		
LIN	= linear taper (used in parts list)	oz	= ounce	SQ	= square		
lin	= linear	Ω	= ohm	SWR	= standing-wave ratio		
LK	= lock washer	P	= peak (used in parts list)	SYNC	= synchronize		
WASH	= lock washer	PAM	= pulse-amplitude modulation	T	= timed (slow-blow fuse)		
LO	= low; local oscillator	PC	= printed circuit	TA	= tantalum		
LOG	= logarithmic taper (used in parts list)	PCM	= pulse-code modulation; pulse-count modulation	TC	= temperature compensating		
log	= logarithmic	PDM	= pulse-duration modulation	TD	= time delay		
LPF	= low pass filter	pF	= picofarad	TERM	= terminal		
LV	= low voltage	PH BRZ	= phosphor bronze				
m	= meter (distance)	PHL.	= Phillips				
mA	= milliampere	PIN	= positive-intrinsic-negative				
MAX	= maximum						
MAX	= megohm						
MΩ	= meg (10 <sup>6</sup> ) (used in parts list)						
MEG	= meg (10 <sup>9</sup> ) (used in parts list)						
MET FILM	= metal film						
MET OX	= metal oxide						
MF	= medium frequency; microfarad (used in parts list)						

#### NOTE

All abbreviations in the parts list will be in upper case.

### MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10 <sup>12</sup>
G	giga	10 <sup>9</sup>
M	mega	10 <sup>6</sup>
k	kilo	10 <sup>3</sup>
da	deka	10
d	deci	10 <sup>-1</sup>
c	centi	10 <sup>-2</sup>
m	milli	10 <sup>-3</sup>
μ	micro	10 <sup>-6</sup>
n	nano	10 <sup>-9</sup>
p	pico	10 <sup>-12</sup>
f	femto	10 <sup>-15</sup>
a	atto	10 <sup>-18</sup>

Table 5-1. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
41	10783-60001	1	BOARD ASSEMBLY, I/O	28490	10783-60001
A1C1	0180-1714	2	CAPACITOR-FXD; 330UF+-10% 6VDC TA-SOLID	56289	1500337X900652
A1C2	0160-0157	5	CAPACITOR-FXD 4700PF +-10% 200WVDC POLYE	56289	292P47292
A1C3	0160-4084	3	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C4	0170-0066	1	CAPACITOR-FXD .027UF +-10% 200WVDC POLYE	56289	292P27392
A1C5	0180-0374	1	CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	1500106X902082
A1C6	0160-0157		CAPACITOR-FXD 4700PF +-10% 200WVDC POLYE	56289	292P47292
A1C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C8	0160-0157		CAPACITOR-FXD 4700PF +-10% 200WVDC POLYE	56289	292P47292
A1C9	0160-0157		CAPACITOR-FXD 4700PF +-10% 200WVDC POLYE	56289	292P47292
A1C10	0160-0157		CAPACITOR-FXD 4700PF +-10% 200WVDC POLYE	56289	292P47292
A1C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C12	0180-0374	1	CAPACITOR-FXD; .47UF+-10% 35VDC TA	56289	1500474X9035A2
A1C13	1901-0028	1	DIODE-PWR RECT 400V 750MA DO-29	04713	SR1358-9
A1C14	1901-0040	4	DIODE-SWITCHING 30V 50NA 2NS DO-35	28480	1901-0040
A1C15	1901-0040		DIODE-SWITCHING 30V 50NA 2NS DO-35	28480	1901-0040
A1C16	1901-0040		DIODE-SWITCHING 30V 50NA 2NS DO-35	28480	1901-0040
A1C17	1901-0040		DIODE-SWITCHING 30V 50NA 2NS DO-35	28480	1901-0040
A1F1	2110-0520	1	FUSE 5A 125V FAST-BLD .348X.25 UL	75915	273005
A1J1	1251-3283	1	CONNECTOR; 24-CONTR; FEM; MICRODRIB804	28480	1251-3283
A1G1	1354-0560	1	TRANSISTOR NPN SI DARL PD=310MW	04713	SP56740
A1K1	1810-0135	2	NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0136
A1K2	1810-0135		NETWORK-RES 10-PIN-SIP .1-PIN-SPCG	28480	1810-0136
A1K3	0683-1215	5	RESISTOR 120 5% .25W FC TC=-400/+600	01121	C81215
A1K4	0683-3315	2	RESISTOR 330 5% .25W FC TC=-400/+600	01121	C93315
A1K5	0683-3315		RESISTOR 330 5% .25W FC TC=-400/+600	01121	C93315
A1K6	0683-4735	3	RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
A1K7	1810-0041	3	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0041
A1K8	0683-1215		RESISTOR 120 5% .25W FC TC=-400/+600	01121	C81215
A1K9	1810-0041		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0041
A1K10	0683-1215		RESISTOR 120 5% .25W FC TC=-400/+600	01121	C81215
A1K11			NOT ASSIGNED		
A1K12	0683-2725	38	RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	C82725
A1K13	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	C82725
A1K14	0683-1215		RESISTOR 120 5% .25W FC TC=-400/+600	01121	C81215
A1K15	0683-1215		RESISTOR 120 5% .25W FC TC=-400/+600	01121	C81215
A1K16	0683-4735		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
A1K17	0683-4735		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
A1K18	1810-0041		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0041
A1S1	3101-1973	1	SWITCH ASSEMBLY, SLIDE	11237	206 TYPE
A1U11	1820-0904	1	IC CMPTR	07263	93L240C
A1U12	1820-0621	1	IC SN74 38 N BUFFER	01295	SN7438N
A1U13	1920-1416	2	IC SN74LS 14 N SCHMITT	01295	SN74LS14N
A1U14	1820-1416		IC SN74LS 14 N SCHMITT	01295	SN74LS14N
A1U15	1820-1144	2	IC SN74LS 02 N GATE	01295	SN74LS02N
A1U16	1320-0778	3	IC COUNTER	07263	93L160C
A1U21	1820-1197	5	IC SN74LS 00 N GATE	01295	SN74LS00N
A1U22	1820-1202	1	IC SN74LS 10 N GATE	01295	SN74LS10N
A1U23	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A1U24	1316-0777	1	IC MEMORY	28480	1816-0708
A1J25	1820-1144		IC SN74LS 02 N GATE	01295	SN74LS02N
A1J26	1820-1242	1	IC SN74LS109 N FLIP-FLDP	01295	SN74LS109N
A1J31	1820-1028	2	IC, TTL, DIGITAL 64-BIT RAM	01295	SN7489N
A1J32	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A1J33	1820-1199	2	IC SN74LS 04 N INV	01295	SN74LS04N
A1J34	1816-0708	1	IC MEMORY	28480	1816-0708
A1J35	1820-0778		IC COUNTER	07263	93L160C
A1J36	1820-1199		IC SN74LS 04 N INV	01295	SN74LS04N
A1J41	1820-0709	5	IC RGTR	07263	93L280C
A1J42	1820-0709		IC RGTR	07263	93L280C
A1J43	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A1J44	1820-0778		IC COUNTER	07263	93L160C
A1J45	1820-1112	1	IC SN74LS 74 N FLIP-FLDP	01295	SN74LS74N
A1J46	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A1J51	1820-1028		IC, TTL, DIGITAL 64-BIT RAM	01295	SN7489N
A1J52	1820-0779		IC RGTR	07263	93L280C
A1J53	1820-0709		IC RGTR	07263	93L280C
A1J54	1820-0709		IC RGTR	07263	93L280C
A1J55	1820-0579	1	IC SN74 123 N MV	01295	SN74123N

See introduction to this section for ordering information

Table 5-1. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1XF1	1251-3205	2	CONNECTOR-SGL CONT SKT .022-DIA	28480	1251-3205
A1XS1	1200-0485	1	SOCKET:IC 14-PIN PC MOUNTING	28480	1200-0485
	1530-1098	2	FASTENER:0.136" DIA 6-32 THREAD	00000	080
A2	10783-60002	1	BOARD ASSEMBLY, DISPLAY	28480	10783-60002
A2C1	0180-1714		CAPACITOR-FXD; 330UF+-10% 5VDC TA-SJLID	56289	1500337X900552
A2D51	1990-0511	14	DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D52	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D53	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D54	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D55	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D56	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D57	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D58	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D59	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D510	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D511	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D512	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D513	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D514	1990-0511		DISPLAY NUM SEG 1 CHAR .43 IN HIGH	28480	1990-0511
A2D515	1990-0416	3	LED-VISIBLE	28480	1990-0416
A2D516	1990-0416		LED-VISIBLE	28480	1990-0416
A2D517	1990-0416		LED-VISIBLE	28480	1990-0416
A2J1	1251-2034	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	71785	252-10-30-330
A2Q1	1853-0326	14	TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q2	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q3	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q4	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q5	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q6	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q7	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q8	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q9	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q10	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q11	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q12	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q13	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q14	1853-0326		TRANSISTOR PNP SI PD=1W FT=50MHZ	28480	1853-0326
A2Q15	1854-0492	8	TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q16	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q17	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q18	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q19	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q20	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q21	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2Q22	1854-0492		TRANSISTOR NPN SI PD=350MW FT=250MHZ	28480	1854-0492
A2R1	0686-2705	8	RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R2	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R3	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R4	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R5	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R6	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R7	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R8	0686-2705		RESISTOR 27 5% .5W CC TC=0+412	01121	EB2705
A2R9	0683-2725	14	RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R10	0683-2725		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R11	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R12	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R13	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R14	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R15	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R16	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R17	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R18	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R19	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R20	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R21	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R22	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R23	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R24	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R25	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715

See introduction to this section for ordering information

Table 5-1. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2K26	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R27	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R28	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R29	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R30	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R31	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R32	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R33	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R34	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R35	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2P36	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R37	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R38	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R39	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R40	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R41	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R42	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R43	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R44	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R45	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R46	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R47	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R48	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R49	0683-2715		RESISTOR 270 5% .25W FC TC=-400/+600	01121	CB2715
A2R50	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2H51	0683-2215	3	RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A2J52	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2S53	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R54	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R55	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R56	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A2R57	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R58	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A2R59	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R60	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2R61	0683-2725		RESISTOR 2.7K 5% .25W FC TC=-400/+700	01121	CB2725
A2S1	3101-0647	1	SWITCH-PB SPDT MOM 1A 120VAC	09353	P8121CX
A2U1	1820-0495	1	IC DECODER	07263	9311DC
A2J2	1816-0709	1	IC MEMORY	28480	1816-0709
A2X0S1	1200-0496	14	SOCKET, IC 16-PIN	01295	080
A2X0S2	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S3	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S4	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S5	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S6	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S7	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S8	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S9	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S10	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S11	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S12	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S13	1200-0496		SOCKET, IC 16-PIN	01295	080
A2X0S14	1200-0496		SOCKET, IC 16-PIN	01295	080
	05000-20017	3	SPACER, LED, SINGLE	28480	05000-20017
			CHASSIS AND MISCELLANEOUS PARTS		
S1	3101-1541	1	SWITCH-SL DPDT-NS MINTR 1A 125VAC	28480	3101-1541
	10783-60003	1	CABLE, POWER	28480	10783-60003
	0360-0643	1	BARRIER BLOCK FEED-THRU SLDR STUD PHEN	28480	0360-0643
	0380-0643	2	MOUNTING STUD-METRIC	28480	0380-0643
	1460-1345	2	WIREFORM 1.34-W 3-LG SST	28480	1460-1345
	2190-0017	2	WASHER-LK HLCL NO. 8 .168 IN ID .31 IN	28480	2190-0017
	2420-0022	6	NUT-SPECIALTY 6-32-THD .23-THK .354-DD	77122	NR632005
	2510-0205		SCREW-MACHINE	28480	2510-0205
	5001-0438	2	TRIM:SIDE	28480	5001-0438
	5020-8813	1	FRAME:FRONT	28480	5020-8813
	5040-7201	4	FOOT(STANDARD)	28480	5040-7201
	5040-7203	1	TRIM:TOP 1/2	28480	5040-7203
	5040-72-3	1		28480	5040-72-3
	5040-7208	1	COVER:TOP	28480	5040-7208
	5040-7209	1	COVER:BOTTOM	28480	5040-7209
	5040-7212	2	COVER:SIDES	28480	5040-7212
	10783-00001	1	PANEL, FRONT- SUB	28480	10783-00001
	10783-00003	1	PANEL, REAR	28480	10783-00003
	10783-20101	1	PANEL, FRONT	28480	10783-20101
	10783-20102	1	HOLDER, LEGEND	28480	10783-20102

See introduction to this section for ordering information

Table 5-2. Manufacturers Code List

Mfr. Number	Manufacturer Name	Address	ZIP Code
00000	U.S.A. Common	Any Supplier of USA	
01121	Allen Bradley Co.	Milwaukee, WI	53212
01295	Texas Instruments Inc., Semiconductor Cmpnt. Div.	Dallas, TX	75231
04713	Motorola Semiconductor Products	Phoenix, AZ	85008
07263	Fairchild Semiconductor Division	Mountain View, CA	94040
09353	C and K Components, Inc.	Watertown, MA	02172
11237	CTS Keene, Inc.	Paso Robles, CA	93446
28480	Hewlett-Packard Company, Corporate Headquarters	Palo Alto, CA	94304
56289	Sprague Electric Co.	North Adams, MA	01247
71785	TRW Electronic Components, Cinch Division	Elk Grove Village, IL	60007
75915	Littlefuse, Inc.	Des Plaines, IL	60016
77122	Palnut Co United-Carr Div TRW Inc	Mountainside, NJ	07092

**5-6. BACKDATING**

5-7. If your instrument has serial prefix 1536A or 1532A, it was supplied with a 59995A/C18 Power Cable instead of the 10783-60003. These cables are identical. Change the parts list on page 5-5 to reflect this.

5-8. If your instrument has serial prefix 1532A, make the change indicated above and change the parts list on page 5-5 as follows:

Delete: 0380-0643, 2, Mounting Stud Metric  
Add: 0380-1036, 2, Spacer Hex 6-32



## SECTION VI SCHEMATIC DIAGRAMS

### 6-1. INTRODUCTION

6-2. This section contains information for the schematic diagram, notes, reference designation system, identification markings on printed-circuit boards, schematic and component locators.

### 6-3. SCHEMATIC DIAGRAM NOTES

6-4. Figure 6-1 shows the symbols used on the schematic diagrams. Notes are also included on each schematic diagram.

### 6-5. REFERENCE DESIGNATOR SYSTEM

6-6. Figure 6-1 shows the method of assigning reference designations. Assemblies such as printed-circuit boards are assigned in sequence, A1, A2, etc. As shown in Figure 6-1, subassemblies within assemblies are given a subordinate A number. For example, rectifier assembly A1 has the complete designator of A25A1. For individual components, the complete designator is determined by adding the assembly number and subassembly number if any. For example, CR1 on the rectifier assembly is designated A25A1CR1.

### 6-7. IDENTIFICATION MARKINGS ON PRINTED-CIRCUIT BOARDS

6-8. HP printed-circuit boards (see Figure 6-1) have four identifications numbers; an assembly part number, a series number, a revision letter, and a production code.

6-9. The assembly part number has 10 digits (such as 10783-60001) and is the primary identification. All assemblies with the same part number are interchangeable. When a production change is made on an assembly that makes it incompatible with previous assemblies, a change in part number is required. The series number (such as 1548A) is used to document minor electrical changes. As changes are made, the series number is incremented. When replacement boards are ordered, you may receive a replacement with a different series number. If there is a difference between the series number marked on the board and the schematic in this manual, a minor electrical difference exists. If the number on the printed-circuit board is lower than that on the schematic, refer to Section VII for back-dating information. If it is higher, refer to the loose-leaf manual change sheets for this manual. If the manual change sheets are missing, contact your local Hewlett-Packard Sales and Service Office. See the listing on the back cover of this manual.

6-10. Revision letters (A, B, etc.) denote changes in printed circuit layout. For example, if a capacitor type is changed (electrical value may remain the same) and requires different spacing for its leads, the printed-circuit board layout is changed and the revision letter is incremented to the next letter. When a revision letter changes, the series number is also usually changed. The production code is the four digit, seven segment number used for production purposes.

6-11. Symbols are used on PC boards to aid in identifying pin numbers, diode elements, etc. as follows:

△ OR □

#### IDENTIFIES:

- Pin 1 of dip and flat-pack IC's.
- Tab of TO cases.
- + side of electrolytic capacitors.
- Pin 1 of resistor packs.
- Cathode of diodes.
- Section 1 of dip switches.

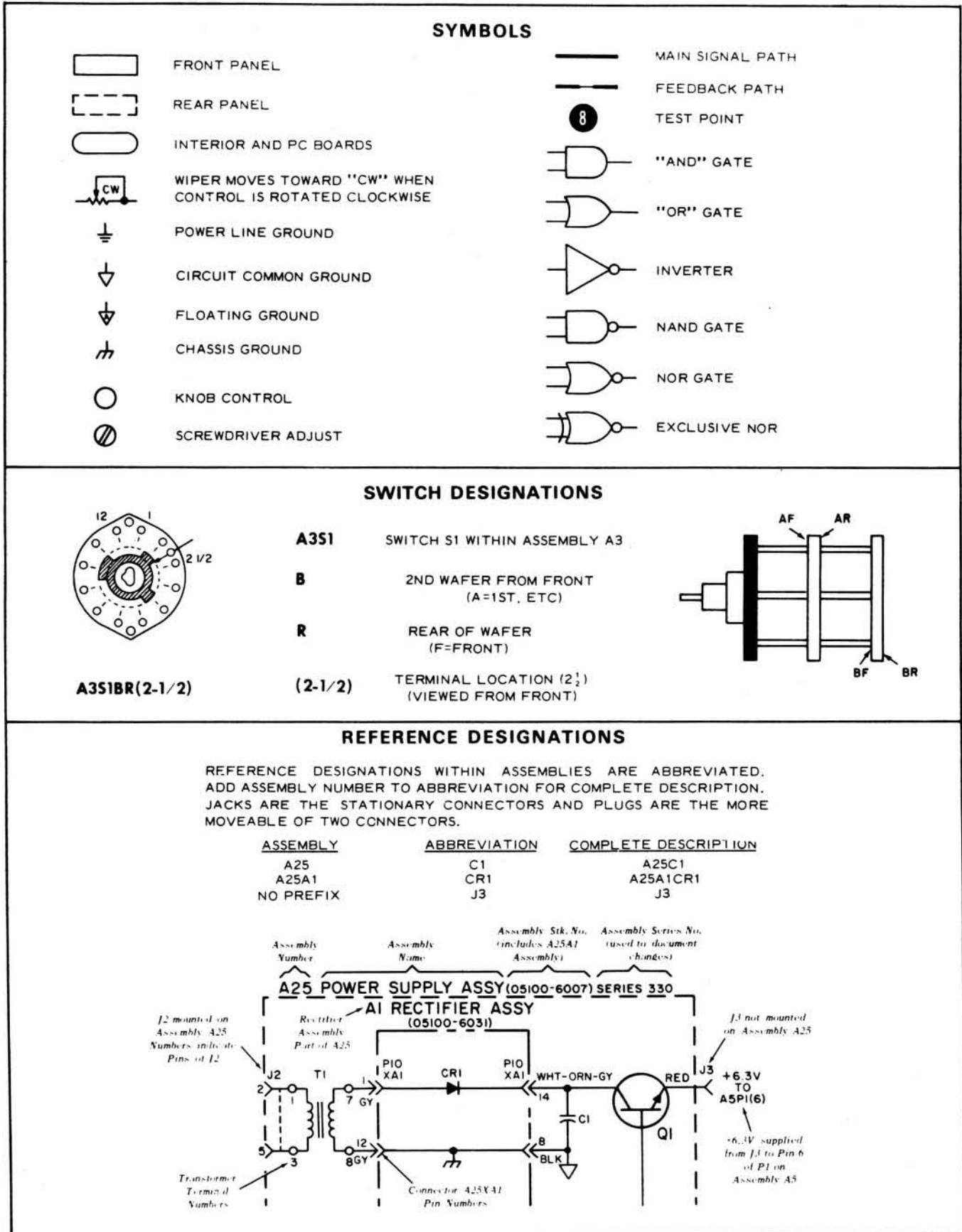


Figure 6-1. Schematic Diagram Notes



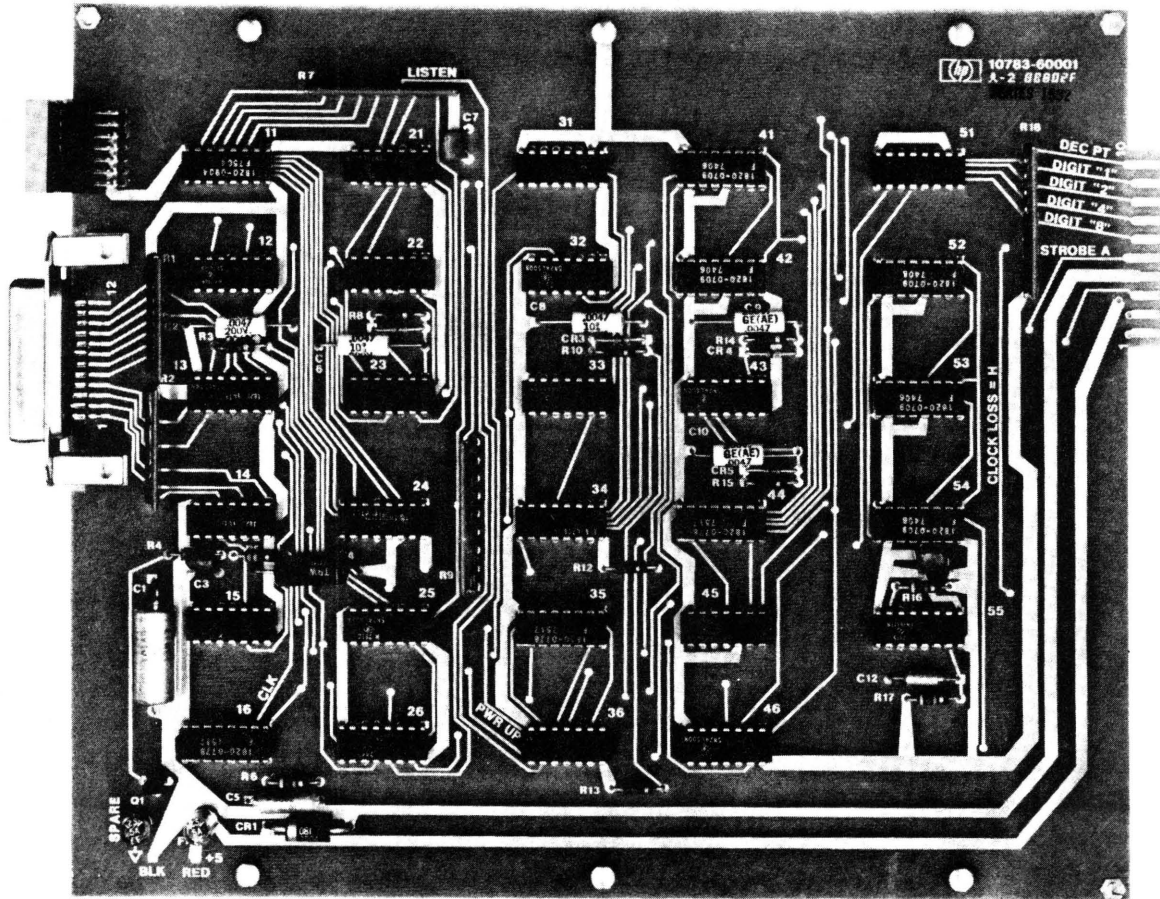
**6-12. ASSEMBLY LOCATIONS AND COMPONENT LOCATORS**

6-13. A component locator for the printed-circuit assembly is located next to the schematics.

**6-14. SCHEMATIC DIAGRAMS**

6-15. Reference designations are assigned in order of physical location. Integrated circuit reference designations are assigned in sequence of location by rows and columns in cartesian coordinates.

Part of Figure 6-2.



**U2 1816-0709 ROM LISTING**

WORD*	OUTPUT						
	U2 PIN 9	U2 PIN 7	U2 PIN 6	U2 PIN 5	U2 PIN 3	U2 PIN 2	U2 PIN 1
0	L	L	L	L	L	L	L
1	L	L	H	H	H	H	H
2	L	L	L	L	L	H	L
3	L	H	L	H	H	H	H
4	L	H	L	L	H	H	H
5	L	H	H	L	L	H	L
6	L	H	H	L	H	H	L
7	L	H	H	H	H	L	H
8	L	L	L	L	L	H	H
9	L	H	H	H	H	H	H
10	L	H	H	L	H	H	H
11	L	H	H	H	L	L	H
12	L	H	L	L	L	L	L
13-15	L	L	L	L	L	L	L
16	H	L	L	L	L	L	L
17	H	L	L	L	L	H	H
18	H	L	L	L	L	H	L
19	H	H	L	H	H	H	H
20	H	H	L	L	H	H	H
21	H	H	L	L	H	H	L

\*Decimal equivalent of Binary Input Address.  
Example: Word 13 for U2 is A0 = 1, A1 = 0, A2 = 1, A3 = 1, A4 = 0:  
01101 = 13.

**U18 1816-0708 ROM LISTING**

WORD*	OUTPUT							
	U18 PIN 9	U18 PIN 7	U18 PIN 6	U18 PIN 5	U18 PIN 4	U18 PIN 3	U18 PIN 2	U18 PIN 1
0	H	H	H	H	H	H	H	H
1-11	H	H	H	H	H	H	H	H
12	H	H	H	L	H	H	H	H
13	H	H	H	H	H	H	H	H
14	H	H	H	H	L	H	H	H
15	H	H	H	H	H	L	H	H
16	L	H	H	H	H	L	H	H
17	L	H	H	H	H	L	H	H
18	L	H	H	H	H	L	H	H
19	L	H	H	H	H	L	H	H
20	L	H	H	H	H	L	H	H
21	L	H	H	H	H	L	H	H
22	L	H	H	H	H	L	H	H
23	L	H	H	H	H	L	H	H
24	L	H	H	H	H	L	H	H
25	L	H	H	H	H	L	H	H
26	L	H	H	H	H	L	H	H
27	L	H	H	H	H	L	H	H
28	L	H	H	H	H	L	H	H
29	H	H	L	H	H	H	L	H
30	H	H	L	H	H	H	L	H
31	H	L	H	H	H	H	L	L

\*Decimal equivalent of Binary Input Address.  
Example: Word 13 for U18 is A0 = 1, A1 = 0, A2 = 1, A3 = 1, A4 = 0:  
01101 = 13.

**U17 1816-0707 ROM LISTING**

WORD NO.*	OUTPUT			
	U17 PIN 9	U17 PIN 10	U17 PIN 11	U17 PIN 12
0 thru 31, 64 thru 127, 174	H	H	H	H
32 thru 62, 173	H	H	L	L
63, 128 thru 137, 139 thru 159, 161 thru 170, 175, 187 thru 196, 198 thru 255	H	H	H	L
138	H	H	L	H
160, 171, 172, 186	L	L	L	L
176	L	L	L	H
177	L	L	H	L
178	L	L	H	H
179	L	H	L	L
180	L	H	L	H
181	L	H	H	L
182	L	H	H	H
183	H	L	L	L
184	H	L	L	H
185	H	L	H	L
197	H	L	H	H

\*Decimal equivalent of Binary Input Address.  
Example: Word 176 for U17 is A = 0, B = 0, C = 0, D = 0, E = 1, F = 1, G = 0, H = 1: 10110000 = 176.

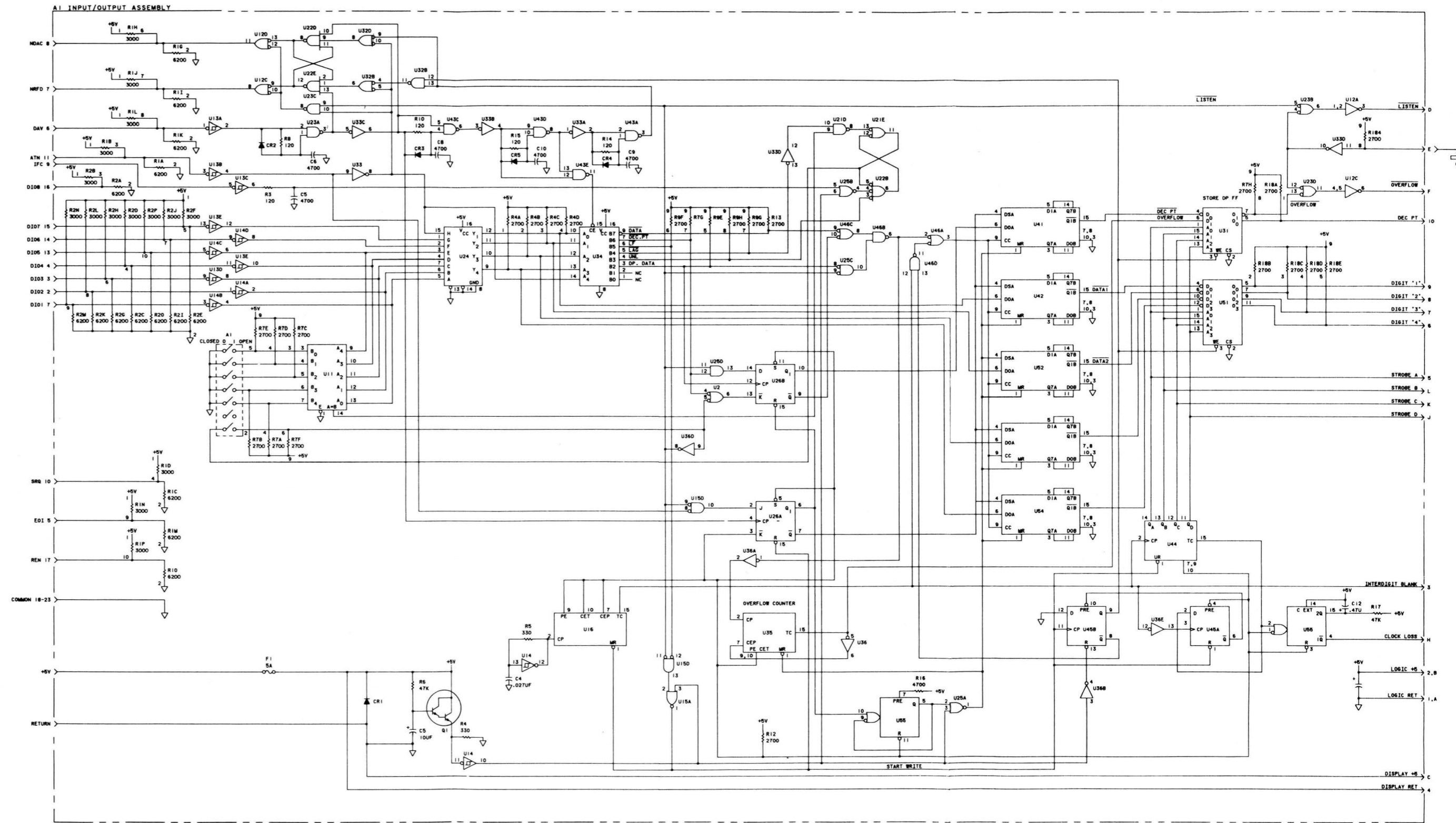


Figure 6-2. A1 Main Schematic Diagram

Figure 6-2  
**A1 MAIN SCHEMATIC DIAGRAM**  
(See Page 6-5)

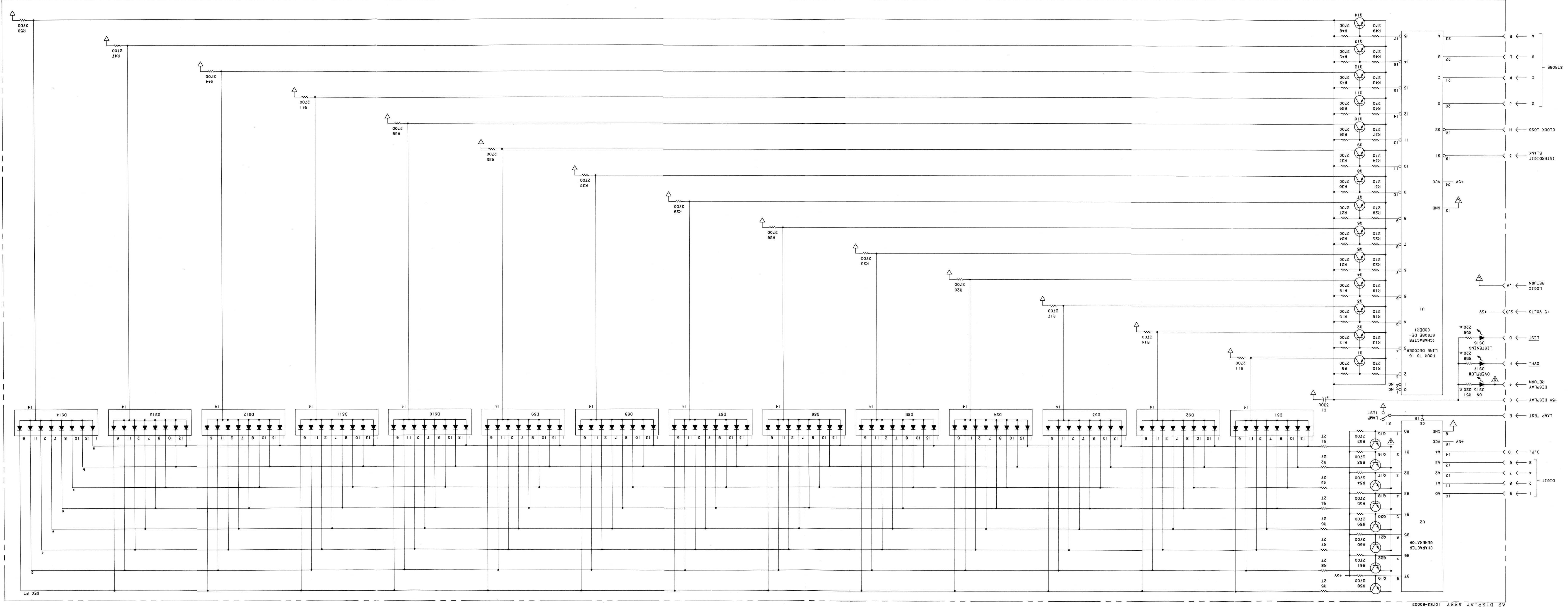
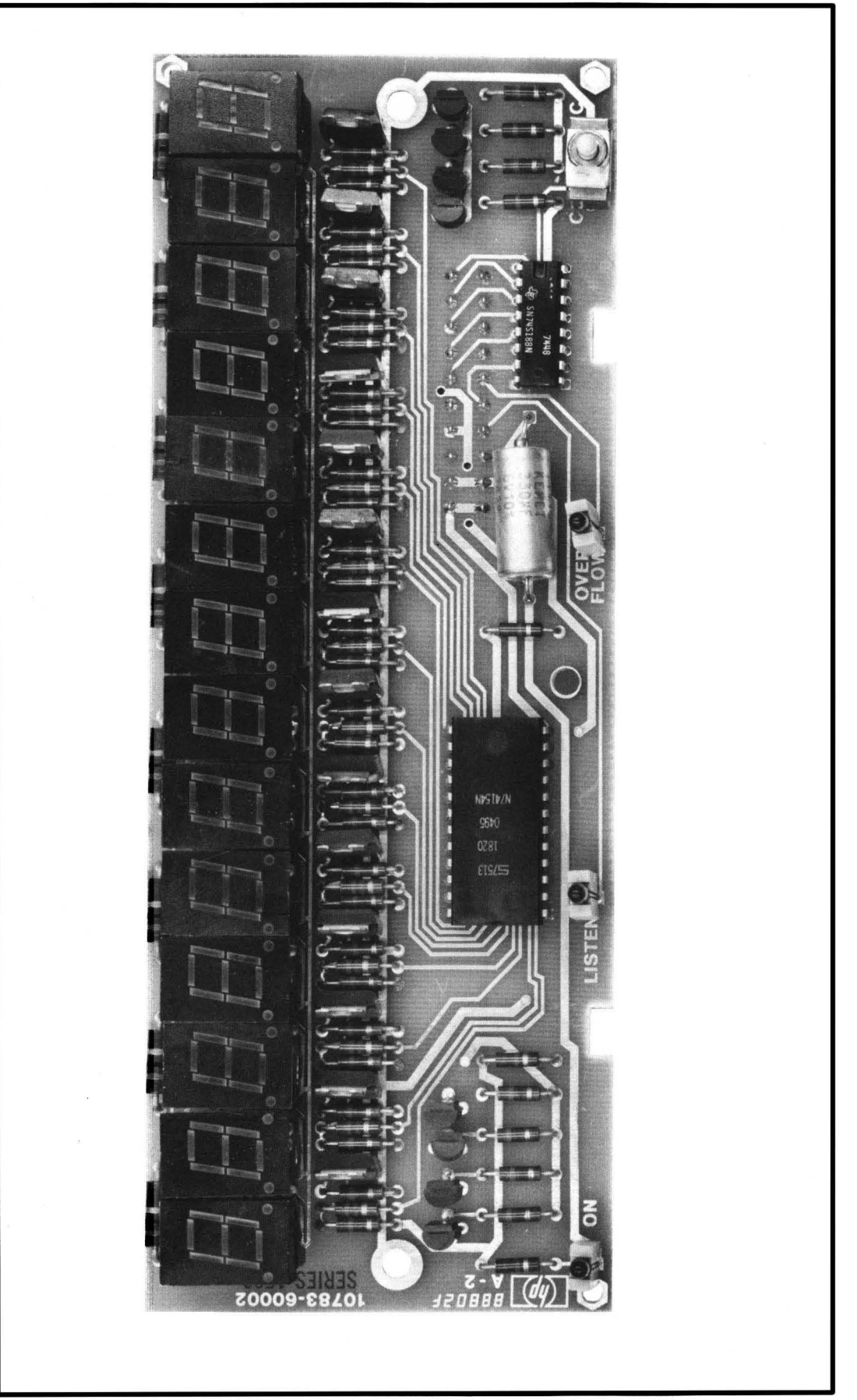


Figure 6-3. A2 Display Assembly Schematic Diagram





